

uG-LilyPond - Floating Plant Pond for Microgravity, Phase I

Completed Technology Project (2017 - 2018)



Project Introduction

The proposed μ G-LilyPond is an autonomous environmentally controlled floating plant cultivation system for use in microgravity. The μ G-LilyPond concept expands the types of crops that can be grown on a spacecraft in a flexible, efficient, low maintenance package. The μ G-LilyPond features several innovations relative to state of the art, including passive water and nutrient delivery to floating plants, volume efficiency, minimal time for maintenance, full life-cycle (seed to seed) support, and crop flexibility. Small floating macrophytes like Duckweed and Azolla are 100% edible (with no inedible biomass), nutritious (high in protein), exceptionally fast growing, and able to thrive in nutrient rich wastewater. The μ G-LilyPond concept aims to maximize production of these tiny plants in a very small volume, for use as a crew dietary supplement, atmospheric revitalization component (CO₂ reduction to O₂), and potentially a metabolic wastewater treatment facility. The goal of this Phase I project is to develop a conceptual design for a reliable, flexible, and efficient floating plant production system for use in microgravity. Phase 1 Objectives are to 1. Determine feasibility of passive water delivery to floating aquatic plants in microgravity; 2. Determine feasibility for continuous autonomous biomass harvest and water (effluent) extraction; 3. Determine feasibility of autonomous floating plant propagation; 4. Define autonomous environmental monitoring and control methods to support candidate crops; 5. Estimate cultivation system efficiency, in terms of production capacity versus equivalent system mass; and 6. Plan for future development of a fully functional flight unit. This collaborative effort between Space Lab Technologies, LLC and the Bioastronautics research group from the University of Colorado (CU) Boulder Aerospace Engineering Sciences Department will combine modeling, analysis, and engineering to demonstrate technology feasibility.



uG-LilyPond - Floating Plant Pond for Microgravity, Phase I Briefing Chart Image

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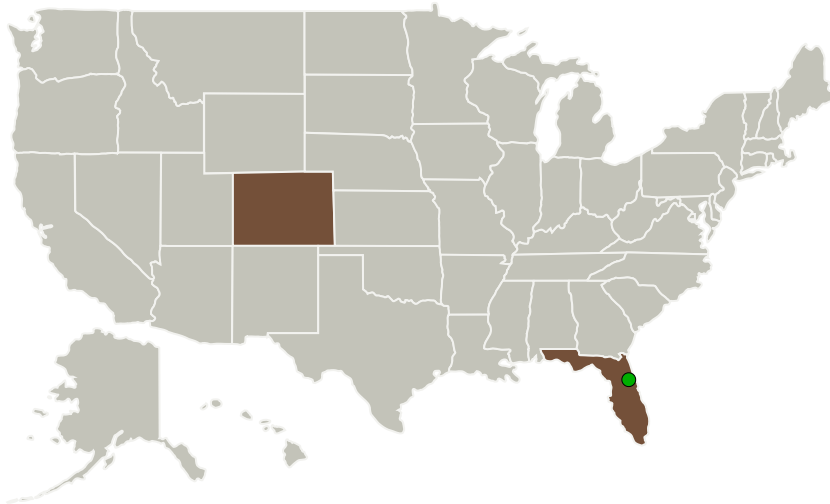
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Space Lab Technologies, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Pinecliffe, Colorado
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
University of Colorado Boulder	Supporting Organization	Academia	Boulder, Colorado

Primary U.S. Work Locations

Colorado	Florida
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Space Lab Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

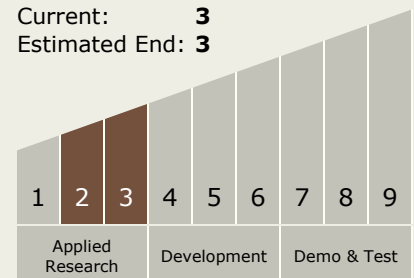
Carlos Torrez

Principal Investigator:

Christine Escobar

Technology Maturity (TRL)

Start: 2
 Current: 3
 Estimated End: 3

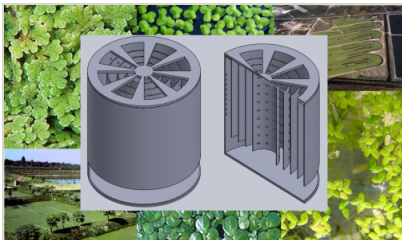


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Images



Briefing Chart Image

uG-LilyPond - Floating Plant Pond
for Microgravity, Phase I Briefing
Chart Image
(<https://techport.nasa.gov/image/128133>)

Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.2 Mission Infrastructure, Sustainability, and Supportability
 - └ TX07.2.1 Logistics Management

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System